

## A NEW LABYRINTHODONT FROM THE KANSAS COAL MEASURES.

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The remains of labyrinthodonts in the coal measures of North America are very scanty. The specimens described from this horizon can be counted almost on the fingers of one hand.

The earliest discovery of labyrinthodont-like remains was made by Dawson, in 1850, in the coal measures of Nova Scotia. He secured from the coal mines near Albion an incomplete skull, which he sent to London, where it was described in 1854 by Sir Richard Owen as *Baphetes planiceps*. Its relations with the typical labyrinthodonts are somewhat uncertain, but it is more closely related to that group than to any other, so far as we may judge from the material preserved.

Hay<sup>a</sup> places this form in his new suborder, Apœcospondyli and in the family Dendrepentidae. Hay includes also in this new suborder the Sauropleuridae, Archegosauridae, Cricotidae, Anthracosauridae, Eryopidae, and Mastodonsauridae, which is a very heterogeneous assemblage. *Baphetes* and *Dendrerpeton* may possibly belong in the same family, but they are still too imperfectly known to be sure of their relations. The Sauropleuridae are typical microsaurs. Two orders and three suborders are represented by the other families included by Hay in his Apœcospondyli.

The discovery of *Baphetes* was followed in 1863 by the finding of typical labyrinthodont vertebræ in the coal measures of Nova Scotia, unless it be that the species of *Dendrerpeton* prove to be labyrinthodont, in which case their discovery would precede that just mentioned. The two vertebræ were described and named by Prof. O. C. Marsh, at that time a student of Agassiz's and an enthusiastic collector of minerals, as *Eosaurus canadensis* and the form was allied by him with the ichthyosaurs and plesiosaurs. The fallacy of this relationship was shown by Huxley in his description of *Anthracosaurus russelli* from the coal measures of Scotland,<sup>b</sup> when he pointed out the marked relations of the two forms as exhibited by their vertebral structure.

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<sup>a</sup> Catalogue of Vertebrates, p. 418.

<sup>b</sup> Quart. Journ. Geol. Soc., vol. 19, 1863, p. 66, and also p. 52.

Save for a few footprints discovered in 1849 by Lea in the coal measures of Pennsylvania the specimens above mentioned were the only evidences or suggestions of labyrinthodonts from the coal measures of North America until the year 1875, when Cope<sup>a</sup> described a fragmentary skull from the coal measures of Linton, Ohio, as *Tuditonus huxleyi*. The present writer,<sup>b</sup> in 1909, restudied the type of this species and placed it in a new genus, *Macrerpeton*, and suggested the labyrinthodont nature of the species, though the evidence was somewhat imperfect. Later in the same year he described and figured a large rib of undoubted labyrinthodont nature from the coal measures of Linton, Ohio, and located it tentatively with the fragmentary skull in the species *Macrerpeton huxleyi* (Cope).<sup>c</sup>

No further discoveries were made in the coal measures for more than twenty years. In 1897 Doctor Williston described and figured a typical labyrinthodont tooth from the coal measures of Kansas. He compared this tooth, which had been found near Louisville, Kansas, by Herbert Bailey, with the teeth of *Mastodonsaurus* from the Trias of Germany, but was unable to detect characters in the tooth and few bone fragments he possessed which would distinguish the Kansas Carboniferous form from the European Triassic genus, so he located it tentatively in *Mastodonsaurus*.

The present specimens, described below as a new genus and species, represent the fifth or possibly the sixth discovery of labyrinthodont-like remains in the coal measures of this continent. The exact locality from which the specimens came is not known. They were secured some two or three years ago by the U. S. National Museum with the (Gustav) Hambach collection, so I am told by Mr. C. W. Gilmore, through whose courtesy the specimen was first called to my attention and subsequently loaned me for study. On a slip of paper accompanying the specimens was written in pencil, evidently by Mr. Hambach, "Coal Measures, Washington Co., Kansas."

In the recently published geological map of Kansas<sup>d</sup> no coal-measure deposits are indicated in Washington County, but they outcrop at the fork of the Blue River in Marshall County near Marysville, and since the topography of the region is quite rough, as shown by the Washington and Marysville topographic sheets, and especially since there is an anticline reported to occur running northeast-southwest near Marysville, coal-measure deposits might very readily be expected to occur in the eastern edge of Washington County near the banks of the Little Blue River or its tributaries.

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<sup>a</sup> Geol. Surv. Ohio, vol. 2, pt. 2, p. 397, pl. 34, fig. 2.

<sup>b</sup> Journ. Geol., vol. 7, no. 1, p. 72, fig. 17.

<sup>c</sup> Proc. U. S. Nat. Mus., vol. 37, p. 28, pl. 8, fig. 4.

<sup>d</sup> Geol. Surv. Kans., vol. 9, 1908.

## ERPETOSUCHUS, new genus.

The genus is very readily distinguished by two prominent characters: The short uniform dentition and the presence of two elongate, oval, internal mandibular foramina on the inner side of the jaw. The genus may be further distinguished by the great depth of the posterior portion of the jaw and the slender anterior part as well as by the ornamentation, which is typically the rough tuberculated labyrinthodont sculpture on the anterior end of the mandible. This changes gradually to longitudinal grooves and ridges of a rather small size on the posterior portion, a very unusual arrangement for a labyrinthodont.

These characters are sustained by those of the skull fragment, in which the dentition is uniform and the sculpture very similar to that of the mandible. The ribs are long, curved, and solid as in other labyrinthodonts.

The genus receives its name from the similarity of the internal surface of the jaw to that of the crocodiles and alligators of the present day.

(ἔρπετόν = a creeping thing; σοῦχος = crocodile.)

## ERPETOSUCHUS KANSENSIS, new species.

The species is represented in the collection of the U. S. National Museum by a fragment of a skull, with portions of two ribs (Cat. No. 6699, Vert. Pal. U.S.N.M.) and the larger part of the left ramus of the mandible (Cat. No. 6680, Vert. Pal. U.S.N.M.). The mandible was preserved in a large block of coal which contained the impression of the back portion of the mandible from which the bone had been weathered. It was possible to remove the bone and make a plaster cast of the impression. This shows in a very satisfactory manner all the characters of the external surface.

## SKULL.

Only a portion of the left maxilla, with fourteen teeth, and a part of the nasal are preserved. The skull seems to have been flattened sideways and the right side of the skull has been crushed flat under the left. It has not seemed feasible to remove the skull from the matrix.

The teeth are uniform, rather short, bluntly conical, curved backward, and coarsely striate. They are somewhat crowded, the bases being separated from each other by only a fraction of a millimeter.

The maxilla and portion of the nasal are coarsely sculptured with elongate pits and ridges. A portion of the infraorbital lateral line canal is preserved. It is simply a rounded groove with three short branches. It lies near the middle of the maxilla (fig. 1).



## MANDIBLE.

It has been possible to study both sides of the mandible. The left ramus was preserved in the coal with its inner face exposed. This face is broken by two large oval openings, the internal mandibular foramina. This is the term used by Reynolds<sup>a</sup> for the openings on the inner surface of the alligator jaw. A drawing of the jaw of the crocodile is introduced in figure 4 for a direct comparison with the present mandible. So far as I can ascertain, no other known labyrinthodont mandible displays this character in such a marked degree. Doctor Branson has figured in *Anaschisma browni* from the Triassic of Wyoming the inner surface of the right ramus on which there are likewise two openings but differently situated.<sup>b</sup> A

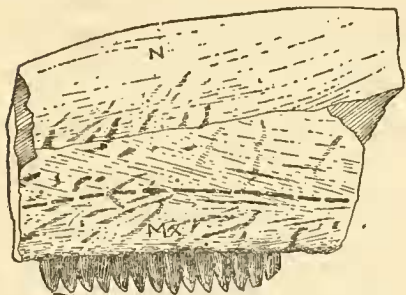


FIG. 1.—PORTION OF THE SKULL OF ERPETOSUCHUS KANSENSIS MOODIE. CAT. No. 6699, U. S. N. M. *Mx*==MAXILLA, *N*=NASAL. LATERAL LINE CANAL REPRESENTED BY HEAVY BROKEN LINE.

similarity between the two mandibles is observed in that the suture separating the prearticular and angular touches the posterior edge of the posterior foramen.

Several of the sutures are well preserved and they have been indicated in the drawing (fig. 2). The pillar separating the two foramina is cut by the suture separating the angular and prearticular very much as in *Anaschisma*, with the difference that in the latter form the angular and prearticular are not approximated. I believe

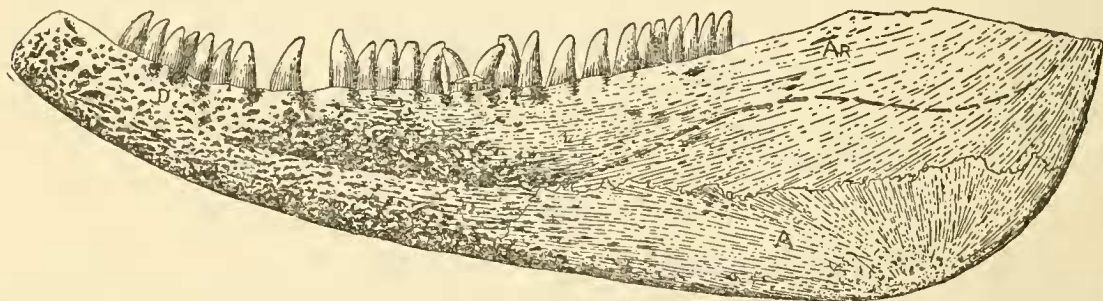


FIG. 2.—OUTER SURFACE OF LEFT MANDIBLE OF ERPETOSUCHUS KANSENSIS MOODIE. CAT. No. 6680, U.S.N.M. *A*=ANGULAR, *Ar*=ARTICULAR. OPERCULO-MANDIBULAR LATERAL LINE CANAL REPRESENTED BY HEAVY BROKEN LINE.

I detect the suture as represented separating the anterior end of the angular from the dentary and splenial. I am assured of the portion near the anterior foramen and also of the part near the tip of the ramus. This shows the angular to be a very elongate element, running very nearly the entire length of the mandible, much as in *Anaschisma* and other labyrinthodont genera. The splenial is a

<sup>a</sup> Vertebrate Skeleton, p. 253.

<sup>b</sup> Branson, Journ. Geol., vol. 13, no. 7, 1905, p. 589, fig. 10.

small, slender element located farther forward, where it has been shoved by the large sized internal mandibular foramina. The pre-articular is a rather long, broad element, of which only a portion is preserved. I am not sure as to the location of the suture for the dentary unless it is represented by the line bounding the roughened area near the teeth. If this is true, the dentary is a large element, since it extends well down upon the outer side of the jaw. The dentary possesses evidences of twenty-six teeth, a few of which are

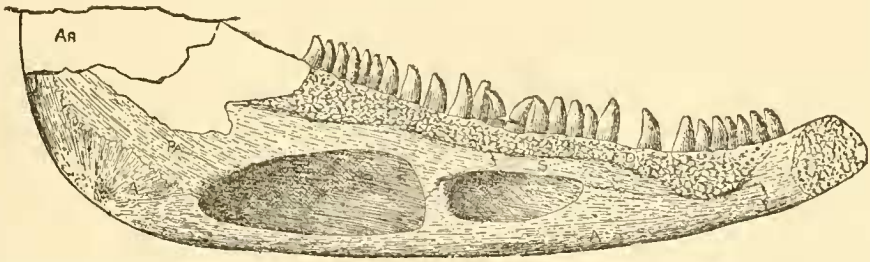


FIG. 3.—INNER SURFACE OF THE MANDIBLE OF ERPETOSUCHUS KANSENSIS MOODIE. A=ANGULAR, Ar=ARTICULAR, D=DENTARY, Pa=PREARTICULAR, S=SPLENIAL.

preserved completely. Most of them are, however, represented either by bases or by impressions in the coal. The teeth are very similar to those of the maxilla, though slightly larger. The characters given for the maxillary teeth will suffice for those of the dentary.

The markings of the inner surface are as indicated in the drawing (fig. 3). The back portion of the angular shows a few radiating lines. The dentary is roughened in two portions; one near the teeth, the other at the tip, where there is a cartilaginous roughening for union with its mate. The remainder of the inner surface is relatively smooth.

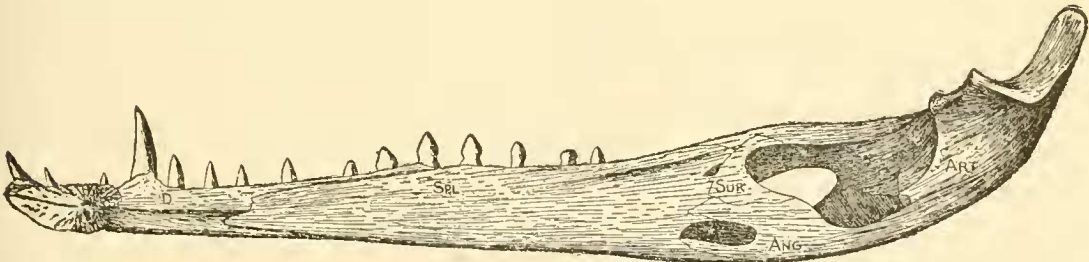


FIG. 4.—RIGHT RAMUS OF MANDIBLE OF CROCODILUS. Ang=ANGULAR, Art=ARTICULAR, D=DENTARY, Spl=SPLENIAL, Sur=CORONOID.

The outer surface shows at the anterior end the typical labyrinthodont sculpturing, which becomes slight grooves and ridges posteriorly. I detect evidences of the operculo-mandibular lateral line canal throughout the entire length of the mandible. Its location is indicated by the heavy broken line in the drawing (fig. 2). The suture between the dentary and angular is quite clear. The suture separating the dentary and splenial joins the angular suture about midway of the length of the jaw.

*Measurements of the skull fragment of Erpetosuchus kansensis Moodie (Cat. no. 6699, U.S.N.M.).*

	mm.
Length of portion preserved.....	109
Maximum width of maxilla.....	45
Thickness of maxilla.....	7
Length of tooth.....	10
Width of tooth at base.....	4

*Measurements of the left ramus of the mandible of Erpetosuchus kansensis Moodie (Cat. no. 6680, U.S.N.M.).*

	mm.
Total length of the jaw as preserved.....	305
Greatest width.....	79
Least width.....	24
Length of angular.....	132
Width of angular.....	45
Length of largest tooth.....	10
Width of largest tooth at base.....	6
Length of most posterior tooth.....	6
Width of most posterior tooth at base.....	4
Length of anterior internal mandibular foramen.....	56
Greatest width.....	15
Least width.....	7
Length of posterior internal mandibular foramen.....	77
Greatest width.....	28
Least width.....	14
Length of bridge.....	16
Width of bridge.....	8

RIBS.

There are portions of two dorsal ribs preserved on the block of coal with the skull. These show characters very similar to those exhibited by the rib ascribed to *Macrerpeton huxleyi* (Cope), and also those of *Metopias diagnosticus* von Meyer, and *Anaschisma*. The ribs are solid, heavy, curved, and have a longitudinal groove on the middle of each side. The heads of the ribs in the present specimen are obscured and nothing can be said of them except that they appear to be large.

*Measurements of ribs of Erpetosuchus kansensis Moodie. (Cat. no. 6699, U.S.N.M.).*

	mm.
Length of preserved portion.....	130
Width at distal end.....	18
Thickness of rib.....	5

RELATIONSHIPS.

The new form finds its nearest relationships with the members of the family Labyrinthodontidæ as used first by Hermann von Meyer in 1842,<sup>a</sup> and by Zittel in 1887,<sup>b</sup> and as correctly redefined and

<sup>a</sup> N. J. Mineral., p. 301.

<sup>b</sup> Handbuch Paleon., vol. 3, p. 401.



strengthened by Doctor Branson in 1905.<sup>a</sup> The family as at present constituted undoubtedly represents a very heterogeneous assemblage, but it must serve as a scrap basket until we learn more of the characters of the forms described.

The following is a list of the labyrinthodont remains described from North America:

Carboniferous:

*Baphetes planiceps* Owen, 1854, Nova Scotia.

(?) *Dendrerpeton*, species Owen.

*Eosaurus canadensis* Marsh, 1862, Nova Scotia.

*Mastodonsaurus*, sp. indet. Williston, 1897, Kansas.

*Erpetosuchus kansensis* Moodie, 1910, Kansas. (Lower Permian?)

(?) *Macrerpeton huxleyi* (Cope), 1874, Ohio.

Permian. None known.

Triassic:

*Dictyocephalus elegans*, Leidy, 1856, North Carolina.

*Eupelor durus* Cope, 1866, Pennsylvania.

*Pariostegus myops* Cope, 1868, North Carolina.

*Metoposaurus fraasi* Lucas, 1904, Arizona.

*Anaschisma browni* Branson, 1905, Wyoming.

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<sup>a</sup> Journ. Geol., vol. 13, no. 7.